

## PLANNING THE 'SMART GRID'

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BOZEMAN — Carl Borgquist's vision started with a whiteboard and a marker in his hands.

Five years later, the president of the Bozeman-based Grasslands Renewable Energy still flourishes a marker and sketches on the whiteboard to illustrate his plan for wind power in the Northern Plains.

Borgquist doesn't build wind farms, rather he's got a plan for collecting and transmitting wind power. Ultimately, he hopes to gather enough wind-generated electricity to equal the output of Hoover Dam, or two coal-fired power plants at Colstrip.

Borgquist refers to Grassland's Wind Spirit Project as part of the theorized "smart grid." What makes it "smart" is that it could solve the inherent problem of wind's variability.

Should Borgquist's vision come to fruition, he and his team at Grasslands are looking to build a system that will gather renewable energy from Montana, North Dakota and Canada and export a dependable 1,000 megawatts to markets in the Southwest and Northwest.

Grasslands has set a target date of 2017 for full build-out.

The project would involve roughly 1,300 miles of collector transmission lines, mostly in Montana, and a novel energy storage system. The two components together could cost \$4 billion.

Add on the related wind farms and trunk transmission, which are not part of Grasslands' project, and the entire package is likely to run in the \$12 billion to \$15 billion range.

"We have to do this big," he said. "There's no mileage in doing this small."

Yet, Borgquist's venture started small, literally "on a whiteboard."

A tax attorney by training, with stints as a district attorney and U.S. Naval Judge Advocate in California, he was lured into the world of transmission while working with a client interested in developing a wind farm.

Borgquist knew that lack of transmission was the bottleneck that prevented the state from developing its plentiful wind resource. He saw the deficiency as a problem that needed fixing.

“Putting the wires in is not the sexy part of this,” he said. “But the way we move power is key. We need to get that figured out.”

Wind power, however, poses another drawback. Even if transmission were available, the erratic nature of wind threatens its economic feasibility.

## **Wind farm network**

Even before Grasslands Renewable came into existence, Borgquist and founding group Absaroka Energy LLC were testing ideas. (Absaroka Energy later partnered with the Calgary-based Rocky Mountain Power to form Grasslands.)

By tracking wind at a variety of locations, they discovered that they could tap different wind sources to modify the peaks and valleys associated with individual wind farms. When wind was dead in Dickenson, N.D., for example, a gale could be blowing in Cut Bank, he said.

They postulated that, by packaging wind from several wind farms, the reliability of the resource would be enhanced.

Though the model proved promising, the data still failed to achieve the team’s desired result: to make wind power as reliable as a coal-fired power plant.

To approach their goal, they added a virtual 600-megawatt pump storage facility to the model.

The proposed closed-loop pump storage facility, which is planned for a site in central Montana, would consist of two large reservoirs of water, one of them 1,000 vertical feet higher than the other.

When wind blows in excess, the extra energy is used to pump water from the lower to the upper reservoir. When the wind dies down, water is released from the upper reservoir, creating hydropower for the grid.

“It’s like a big battery,” Borgquist said. “It’s clean and it’s environmentally friendly.”

The size of the reservoirs determines the hours of reliability, he said, and the vertical distance between the reservoirs determines the amount of energy that can be stored.

Though the concept is not uncommon in Europe, he said, the United States has only one utility-scale pump storage facility, built several decades ago in Virginia.

## **Lacing up the grids**

As Grasslands refined its concept, the company drew the attention of Elecnor, a Spanish company that specializes in energy projects around the globe.

Founded in 1958, Elecnor employs nearly 5,000 people and saw \$2.69 billion in sales in 2008.

“Elecnor found us, tracked us down,” Borgquist said, noting that the two companies are working on a deal that gives Elecnor the option to buy half of Grasslands.

Over the past few years, Borgquist and his expanding team have directed their efforts to all aspects of the project, from generation to delivery. He firmly believes the success of the Wind Spirit Project depends on coordinating all of the pieces together in one package.

As proposed, Grasslands’ large collection system would serve the eastern half of Montana and north-central Montana, with spurs branching out into Canada, North Dakota and possibly Wyoming.

The North Dakota line, a high-voltage 500 kilowatt direct current line, would cross from the Western Electricity Coordinating Council grid to the Midwest Reliability Organization grid, thus opening a new market for Montana wind and bringing additional reliability to the entire system, he said.

Once “lassoed” together, the power from many wind farms would be shipped to hubs planned for Toston and Harlowton. From there, trunk transmission lines such as the Mountain States Transmission Tie and TransCanada’s Chinook project, now in different stages of development, would move the electricity to population centers along the West Coast and in the desert Southwest.

“There’s no load to service in Montana,” Borgquist said, explaining why the power would go out of state.

“Montana will grow, but it won’t grow consistently with the amount of resource we have to develop,” he said.

## **Ready for FERC**

With its feasibility study complete, its preliminary permit filed for the pump storage facility and its application set to go out to the Federal Energy Regulatory Commission in the next week or so, Grasslands is ready to introduce the project to a broader audience.

So far, Borgquist said, Grasslands has talked to 60 renewable energy developers, most working on wind projects. Already, they’ve completed initial agreements with seven of them and look forward to working with others.

Simultaneously, they’re poised to begin talks with landowners regarding right-of-way for the proposed collector line. Environmental analysis of transmission siting is also on the to-do list.

“We haven’t crystallized the map,” Borgquist said. “We’re still looking for resources to connect and ways to connect into the grid.”